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O'BRIEN & GERE

August 18, 1988

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Waste Management Division
USEPA, Region V
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Director
Illinois Environment Protection Agency
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File: 2844-012

Re: Taracorp Granite City RI/FS

Dear Gentlemen:

At the request of Mr. Holt of NL Industries, we have prepared this letter in response to discussions held at the August 3-4 meeting in Chicago. During the August meeting in Chicago we discussed the Risk Assessment for the Taracorp Granite City Remedial Investigation (RI). The Risk Assessment presented in the January 1988 RI Report addressed several exposure routes. The Illinois EPA and U.S. EPA commented that portions of the text should be revised and some assumptions used should be modified. Dr. Appleton met with the agency personnel on August 3 to discuss the issues and he is in the process of revising the Risk Assessment. To accelerate the review process on the soil lead issue we agreed to reevaluate the risk assessment for ingestion of soil containing lead and summarize that information for transmittal to the agencies prior to submission of the RI Report due on September 21, 1988. The final RI submission will address risks associated with other parameters using similar approaches.

Section 8.05.2.2 of the January RI Report included the quantitative assessment of risk associated with soil lead. The approach utilized three methods for assessing the potential risks associated with lead exposure from soils. First, a site-specific risk assessment conducted by the Illinois Environmental Protection Agency (IEPA) was reviewed and evaluated. This study included blood lead analyses on residents of Granite City. Secondly, ingestion and inhalation exposures to lead were estimated and compared to acceptable daily intake levels for lead. Finally, risks were estimated using literature derived correlations between soil lead concentration and blood lead concentrations. This letter comments on the proposed changes to each of these sections.

IEPA Blood Lead Survey Approach

Agency personnel felt that conclusions presented in the IEPA report should be qualified somewhat. They would prefer that the sample size of 97 persons, including 46 children, be larger. In addition, they would have preferred that blood lead analyses be conducted in July or August when maximum outdoor exposure would be expected for children. Unfortunately, IEPA was apparently unable to obtain more participants and the sampling was done in November and December. The data generated provides a solid basis for evaluating the exposure of those 97 residents of Granite City at that time of the year. The revisions to this section of the RI Report will be limited to the addition of some qualifying statements on the number of persons tested and on the timing of the tests. If Dr. Dourson can provide us with information on seasonal variations in blood lead concentrations we will comment on that information.

Acceptable Daily Intake Approach

The Acceptable Daily Intake Approach has been revised somewhat to address agency comments. In addition, lead impacts on human health have been reevaluated by the U.S. EPA with the publication during the second week of August of proposed drinking water standards for lead which are considerably beneath the existing standards. In addition, there is talk of revising the existing 25 ug/dl level of concern to 15 ug/dl by CDC. As a consequence we have revised the previously published chronic daily acceptable intake (AIC) for ingested lead of 1.4 to 0.84 ug/kg/day for the purposes of the Risk Assessment. This reduction is consistent with a reduction of the blood level action concentration from 25 micrograms/deciliter to 15 micrograms/deciliter. The proposed text for the Acceptable Daily Intake Approach follows:

"The U.S. EPA (1986) established a chronic daily acceptable intake (AIC) for ingested lead of 1.4 ug/kg/day, and of 0.43 ug/kg/day via inhalation. In August 1988 the EPA proposed revising the acceptable lead concentration in drinking water from 50 micrograms/liter at the point of use to 10 micrograms/liter at the point of use. This reduction in acceptable lead intake via drinking water may result in a change in the AIC for ingested lead. In addition, CDC is considering a reduction in acceptable blood lead concentration from 25 ug/dl to 15 ug/dl. To establish an additional margin of safety, this risk assessment will use an assumed AIC for ingestion of lead of 0.84 ug/kg/day, or 60% of the published value.

The daily intake of lead can be estimated under worst case conditions by assuming that an individual directly contacts lead-containing soils over an extended period of time and that such contact results in inadvertent ingestion and assimilation of the soil and, subsequently, lead. Such an ingestion rate might be incurred by an individual who, as a child, plays in exposed soils and in later life continues to contact soils through recreational activities such as sports and gardening or through construction work. Soil ingestion rates on a case-specific

basis are largely a matter of conjecture, although several recent studies provide some guidance in this area.

LaGoy (1987) has reviewed the available literature and concluded that the following are reasonable estimates of soil ingestion as a function of age: 0-1 years (10 kg average weight), 50 mg/day; 1-6 years (15 kg weight), 100 mg/day; 6-11 years (30 kg weight), 50 mg/day; and over 11 years (70 kg), 50 mg/day. Calabrese et al (as presented in the Superfund Exposure Assessment Manual, U.S. EPA 1988) has suggested the following typical soil ingestion rates as a function of age: 0-9 months, 0 mg/day; 9-18 months, 50 mg/day; 1.5 to 3.5 years, 200 mg/day; 3.5 to 5 years, 50 mg/day; and 5 to 18 years, 10 mg/day. As an overall average, both U.S. EPA (1986) and U.S. EPA (1988) have suggested 100 mg/day as an overall average for children. This value will be adopted for this risk assessment over the period of 9 months of age to 18 years. For adults (18-70 years) a rate of 10 mg/day is used. To reflect an upper bound exposure rate involving intentional soil ingestion (pica), a rate of 1000 mg/day between the ages of 9 months and 5 years and ingestion of 50 mg/day for the remainder of the lifetime is used.

The exposure assessment will include the following additional assumptions:

1. Exposures will occur 5 times weekly, 26 weeks per year for a 70 year lifetime.

2. Soil lead will be incompletely absorbed relative to residues in water or air. In the Toxicological Profile for lead, ATSDR (1988) a value of 30% absorption of soil-bound lead for children is presented. This value will be used for the direct contact/ingestion scenario at all ages.

The overall average daily soil ingestion can be determined for the EPA suggested scenario as:

$$(100 \text{ mg/day} \times 130 \text{ days per year} \times 18 \text{ years}) + (10 \text{ mg/day} \times 130 \text{ days per year} \times 52 \text{ years})$$
$$\text{or } 234{,}000 \text{ mg} + 67{,}600 \text{ mg}/25550 \text{ days in lifetime}$$
$$= 11.8 \text{ mg/day}$$

For the upper bound worst case, the daily average soil ingestion is estimated by the same approach to be 38.4 mg/day.

The following relationship may be used to estimate a soil level of lead which may be acceptable for long term ingestion:

$$\text{Acceptable Soil Lead (ug/g)} = \frac{\text{Acceptable Daily Intake via soil (ug/kg/day)} \times 70 \text{ kg}}{\text{gram soil ingested/day} \times 0.3 \text{ absorption factor}}$$

At present, U.S. EPA does not offer a verified reference dose for lead, but U.S. EPA (1986) offers a chronic acceptable daily intake (ADI) for the oral route of 1.4 ug/kg/day for long term exposure. To provide an additional margin of safety an adjusted value of 0.84 ug/kg/day will be assumed based on the proposed reduction in acceptable blood lead concentration, from 25 micrograms/dl to 15 micrograms/dl.

An estimate of a soil specific ADI follows. ATSDR (1988) presents data on baseline exposure of an adult male of 49.7 ug/day in food, water and beverages, and dust, or 0.71 ug/kg/day. Correcting with a 50% gastrointestinal absorption efficiency for food (ATSDR, 1988, data for children, less for adults) the non-soil exposure rate is 0.36 ug/kg/day. In addition 0.07 ug/kg/day is absorbed via inhalation. The total absorption is thus 0.43 ug/kg/day. Subtracting this value from the oral ADI gives a soil-specific acceptable daily intake of 0.41 ug/kg/day for lead.

Substituting this value into the above equation for the two scenarios:

$$ASL = \frac{70\ kg \times 0.41\ ug/kg/day}{0.0118\ g\ soil/day \times 0.3} = 8107\ ug/g = (8107\ mg/kg)$$

$$ASL = \frac{70\ kg \times 0.41\ ug/kg/day}{0.038g \times 0.3} = 3189\ mg/g = (3189\ ug/kg)$$

Based on these calculations the soil concentration at which the ADI will be exceeded is approximately 8100 mg/kg using suggested EPA values and 3200 mg/kg using upper bound worst case conditions."

Soil Lead-Blood Lead Correlation Approach

This approach presented statistical data developed by various researchers for predicting blood lead based on soil lead concentrations. The value used was a U.S. EPA suggested value of micrograms/deciliter increase in blood lead for each 1000 mg/kg of soil lead. During the August meeting Mr. Dolan provided a very recent paper which included a study of sites in Idaho and Montana. We are currently reviewing the paper to determine whether a change in this section of the RI Report is appropriate.

If you have any comments on the scope or details of the Risk Assessment please contact me at your convenience at 804 431-2966.

Very truly yours

O'BRIEN & GERE ENGINEERS

Frank D. Hale
Regional Office Manager

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